Behind the Scenes: Patient Safety in the Operating Room and Central Materiel Service During Deployments

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Abstract

The United States Army perioperative nurses face unique patient care situations during overseas deployments. In this report, the experiences at the U.S. Army's 28th Combat Support Hospital in Iraq are described. The lessons learned from these situations can assist in patient safety in future operations. The challenges to the nursing staff of performing "housekeeping" tasks while simultaneously accomplishing a number of other patient care tasks are reviewed. The surgical suite structural requirements for the operating room (OR) and for central materiel service (CMS), and the adaptation of the workflow capabilities through CMS to ensure the best possible sterile products are discussed. Cleaning becomes very difficult in deployed environments because of the mass casualty episodes as well as the relentless wind and sand. The effects of fatigue, sleep deprivation, and stress threaten maintenance of standards and attention to detail. Steam sterilization and glutaraldehyde soaking are useful as sterilization methods when adapted to this harsh environment. With this environment, it was necessary to extend the length of sterilization times, adapt pressure bags to rinse lumens, and realign the work flow to ensure better cleaning and sterilization practices. Cultures of the OR and CMS demonstrated the efficacy of our efforts. Room air exchanges, temperatures, water quality, and other structural requirements were measured on a routine basis and problems were aggressively addressed. The work and traffic flow practices were designed specifically to provide an aseptic environment and functional equipment. Staff safety and well being were given priority in order to maintain standards.

Introduction

U.S. Army perioperative nurses face unique patient care situations when they are deployed to hostile countries with harsh climates. Perioperative nursing refers to nursing activities performed during the preoperative, intraoperative and postoperative phases of a patient's surgical intervention. Lessons learned related to patient safety are extremely important to any Department of Defense (DOD) or Federal Agency responsible for the delivery of patient care along the continuum of the surgical experience in suboptimal environments in the future.

The work flow and work practices of the operating room (OR) and central materiel service (CMS) department are often "behind the scenes" for both patients and other health care professionals. Every hospital will have an operating room,

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and every operating room must have a department to reprocess and sterilize the surgical instruments. The operation of this work center in the hospital is crucial for patient safety.

The U. S. Army's 28th Combat Support Hospital (CSH), nicknamed "China Dragons" from its WWII exploits, had long-term deployment experience in Operation Iraqi Freedom (OIF). The following is a condensed history of its recent deployment experiences: From February 2003 to February 2004, the 28th CSH was deployed in support of OIF. This CSH traveled over 3000 miles in hostile territory and established three separate hospital locations. "LSA (Logistics Support Area) Dogwood," also known as "China Main," 20 miles southwest of Baghdad in the desert, was open April–August 2003 and performed 877 surgeries. "China 32" was permanently separated from the 28th CSH China Main location and moved to Tikrit, where it performed 432 surgeries from June 2003–February 2004. The 28th CSH China Main renovated Ibn Sina Hospital (located in Baghdad's Green Zone), where another 1,255 surgeries were performed from August 2003–February 2004. In these 293 consecutive days of surgery, the China Main portion OR/CMS staff worked an average of 21 hours a day, with an average of seven cases a day, all of which were multi-procedural. The China Main CMS processed 250 autoclave loads per month, (2,500 items per month), including service to "forward surgical teams," medical detachments, area medical companies, and veterinarians in addition to the hospital itself. The 28th CSH took care of U.S. soldiers, coalition forces, Iraqi civilians, and enemy prisoners of war. Surgeries included multiple traumas and burns. The OR nurses and technicians of the 28th CSH faced unique challenges in delivering safe, quality health care. Ingenuity, creativity, clinical innovations, and sheer determination were necessary to compensate for the less-than-optimal environmental conditions, the technological challenges, and the irregular arrival of medical and surgical supplies.

Deployed perioperative nurses often work under stressful conditions in a time-constrained environment. As a result, they are more comfortable with the hands-on aspects of patient care within the OR rather with than the postoperative "housekeeping" duties or the critical, albeit technical, CMS tasks of decontaminating, assembling, sterilizing, and storing surgical instruments. The demands and expertise level of these skill sets expand in a deployment situation. The realization that new technical skills must be taught in a fast paced, uncomfortable, dangerous deployed environment becomes evident very quickly. How are staff motivated to do additional cleaning when they are exhausted? What resources are available to identify standards necessary to provide safe patient care through structural and environmental requirements? Lessons learned in Operation Iraqi Freedom 2003–2004 involved understanding and adapting to structural requirements for both mobile and fixed hospital facilities, and then demonstrating the incredible flexibility needed to meet strategic and tactical situations that changed quickly and constantly.

The 28th CSH faced three distinctly different challenges during OIF: supporting combat missions, peacekeeping missions, and humanitarian missions.

Combat missions involved trauma and burn surgeries, where the goal was to resuscitate, stabilize, and evacuate U.S. and coalition soldiers for higher level care. Patients do not stay very long in the hospital, and the volume of equipment and supplies are planned for saving life, limb, and eyesight. Peacekeeping missions included the primary functions of resuscitation and evacuation, as well as medium-term therapies such as internal implant fixation and elective surgery for non-battle injuries. Additionally, there were no Iraqi facilities to which to transfer Iraqi national patients during most of the yearlong deployment. These patients required care from admission to hospital discharge, and placed a very different set of requirements on the hospital staff. Humanitarian missions included trauma surgery along with a broad-based OR capability, which included internal fixation, reconstructive procedures, and obstetrical and pediatric surgeries. These patients also tended to have prolonged hospital stays and frequently required physical rehabilitation, prosthetics, and other long-term care needs for which the hospital was neither equipped nor staffed (Winthrop, T and Shuler, BJ. Personal communication).

With all missions the location of the mission, weather conditions, and the evacuation policies need to be taken into consideration. Depending on what package has been issued for what mission will determine the types of equipment and supplies that have been fielded for use. It can be difficult to meet humanitarian mission requirements when a combat mission package is what is available for use. For instance, a set of amputation instruments are not for delivering a baby or for performing either plastic surgery or pediatric surgery. It also can be difficult to provide a higher level of definitive care to patients who have no other hospital to transfer to and who are consuming the majority of the limited medical supplies available at that time.

Lessons learned

Cleaning and work traffic patterns

Preoperative concerns

Despite the stringent standards of the OR and CMS departments, potential dangers can still exist with regard to patient safety. Particularly, infectious risk factors related to the operating room include: individual patient associated risks, the condition of the OR environment, ventilation systems, cleaning and sterilization practices, and habits and practices of operating room personnel.[1] OR and CMS traffic and work patterns must be designed to decrease the potential for cross-contamination of personnel and equipment. There are three designated areas for the OR: the unrestricted area where traffic is not limited, the semi-restricted area where traffic is limited to authorized staff and patients, and the restricted area. The semi-restricted area is where scrub attire and hair coverings are worn, the scrub sinks are located, and clean and sterile supplies are stored; it also includes some of the areas used to process surgical instruments. The restricted area includes operating rooms, procedure rooms, and clean-core areas. This is

where full surgical attire and masks are worn. The work flow of people, supplies, and equipment needs to travel from dirty to clean areas in such a way that contaminated items are separated from clean and sterile items by space, time, and traffic patterns.[2] Given the severe austere surroundings of OIF, the OR staff were confronted with finding creative solutions for traffic patterns that did not fit typical hospital designs stateside.

During the deployment, respect for the "red line," imaginary or not, was enforced as much as possible to avoid exposing patients to additional outside contaminants. In the fixed facility in Baghdad, the staff were faced with the lack of a semi-restricted area leading into the actual OR suites. The hallway between the suites was often mistaken for a common pathway to the adjacent Intensive Care Unit. The entire OR staff became responsible for monitoring hospital staff, patient visitors, and workers and for guiding them to adhere to the practice of wearing proper surgical attire in the corridor leading to the suites. Disposable surgical attire was provided at each entrance (elevator and stairs) and signs in Arabic and English were posted to assist in maintaining this standard. The OR staff used what they had to create the best dirty to clean traffic pattern possible. Training and education were paramount to their success.

Another challenge facing the OR staff was patients brought directly to the OR from the emergency room, the intensive care units, or the wards. Due to the nature of the war injuries and the desert environment, patient transport carriers, or "litters," were often full of blood, dirt, clothing, and other personal effects. As bacteria can be transported from one location to another by carriers such as dust or liquids,[3] intradepartmental policies were quickly established for the proper cleaning of these litters to ensure that cross-contamination between patients did not occur.

Rigorous cleaning procedures must be adhered to even in the most austere environments. Cleaning should be performed on a regular basis to reduce the amount of dust, organic debris, and microbial load in surgical environments. Proper cleaning of surfaces can greatly reduce the risk of nosocomial infections by eliminating pathogens on commonly touched areas. The ultimate responsibility for ensuring a clean surgical environment rests with perioperative nurses.[2]

Cleaning the OR and CMS areas in Iraq, whether in the desert environment or in the fixed facility in Baghdad, required continuous effort. Sand and heat worked as constant destructive forces to physical structures, power generators, batteries, electronic devices, and local anesthetic medications. The sand, and all that was carried in it, was very fine and worked its way into every available opening. During deployment it is essential that cleaning practices mirror those back in the United States. Approved cleaning agents should be readily available and easily obtained. Surface cleaners should have a broad antimicrobial spectrum, work quickly and effectively when blood or other protein is present, have a low toxicity, and be safe for health care workers to use. The Army's supply system had cleaning agents, which were registered with the Environmental Protection Agency (EPA), and hospital grade bactericidal, fungicidal, virucidal, and tuberculocidal cleaners. When the supply of these cleaning agents was low,

bleach was still available through the CSH's supply department, as they established access to the local markets. Having a contingency plan for other approved cleaning agents (e.g., bleach) is crucial to ensuring the continuation of safe patient care. Even with substitute cleaning products, work practices suffered no break in the techniques used to clean the OR and CMS areas.

Intraoperative concerns

The microbial level in operating room air is directly proportional to the number of people moving about in the room.[4] On many occasions two surgical procedures would take place in one OR international standards organization (ISO) box. That is how the box is designed and, as the mission dictates, that is the protocol followed. Given the traumatic nature of the cases experienced, often multiple surgeons, scrub technicians, nurses, and anesthesia providers were taking care of one patient. That meant that 12-15 staff and two patients often were in one OR ISO box at one time. When expanded, this box is the following size: 18'4" long, 21'6" wide, and 7'1" high.[5] It is well documented that excessive movement, multiple staff members, and increased conversation all contribute to high levels of airborne contaminants within the OR. However, these conditions were balanced with the need to do whatever was necessary to save life, limb, and eyesight as quickly and as safely as possible.

Seemingly, moving to the fixed facility would significantly improve the OR staff's ability to create a contaminant free environment. In the fixed facility in Baghdad there was very poor room air circulation due to the infrastructure of the building, so initially no air exchange capability was available within the operating rooms. This held the potential for increased microbial contamination. Additionally, pigeons had taken up residence for some time within the ducts on the roof above the operating rooms. Pigeon droppings could be smelled, and feathers could be seen in the vents within the rooms. Rainwater also leaked in through the roof and followed the electrical surgical lights mounted in the ceilings, dripping down into the rest of the operating room or into the rooms used for storing sterile supplies.

With patient safety as the guiding principle, prioritized recommendations were made to the hospital commander and to the Iraqi Ministry of Health for the following improvements:[6]

- eliminate bird feces from the air duct system
- install the proper mechanism to exchange air in the operating rooms at the prescribed rate
- install proper filtration mechanisms to operate in concert with the air exchange system
- improve the operating room flooring surface to facilitate complete removal of blood and other contaminants following surgeries
- install a proper evacuation system for waste anesthesia gases

- improve wall surfaces in CMS to permit the necessary frequent cleanings
- address the ventilation and airflow requirements for the decontamination and assembly areas of CMS
- consider additional requirements for CMS equipment and the attendant issues of power, water delivery, water purity, and steam delivery

Coordination with experts from the U.S. Army Center for Health Promotion and Preventive Medicine, the Association of periOperative Registered Nurses (AORN), the Association for the Advancement of Medical Instrumentation, the U.S. Army Corps of Engineers, and subject matter experts at Walter Reed Army Medical Center in Washington, D.C., greatly assisted the effort to work toward meeting the architectural, medical gas, and other requirements needed to provide safe patient care in the OR and CMS areas. Resources needed for this level and type of information would be invaluable if placed on CD or DVD and taken along as part of the deployed unit. The Internet is not always available, phones are not always functional, mail is not always reliable, and textbooks and manuals are not practical to include in limited, manually carried duffel bags.

When the fixed facility hospital in Baghdad was established and wounds were cultured out, there was concrete evidence of methicillin-resistant Staphylococcus aureus. Following guidelines from the United States, a Multi-Drug Resistant Organism standard operating procedure was created to provide the best possible care for the patients.

War wounds are notoriously dirty, and in spite of all that is done in the hospital, there are still a number of surgical site wound infections. Homemade explosive devices made out of car parts, dirt, nails, screws, glass, rocks, clothing, and general roadside debris injured many of the patients. Shrapnel is not only bits of metal from the primary munitions, but small pieces of the vehicle the victim was riding in, parts of the uniform and equipment he or she was wearing, and shards of bone from other soldiers hurt in the same explosion.

Postoperative concerns

The deployed perioperative nurses with the assistance of surgical scrub technicians were directly responsible for the cleaning of the OR suites, CMS, and other areas within the Surgical Department. Standards and recommended practices from AORN, the Occupational Safety & Health Administration (OSHA), and the Association for Professionals in Infection Control and Epidemiology (APIC) were used to develop work practices and traffic patterns within these areas. These practices were adhered to despite the extremely austere conditions the staff faced daily. Documentation of this cleaning schedule was kept as if the facility were in the United States.

The operating rooms were cleaned in four different manners. These methods included: 1) cleaning before the first scheduled case of the day; all horizontal surfaces in the OR (furniture, surgical lights, equipment) were damp dusted with

the EPA registered hospital disinfectant cleaner; 2) cleaning between cases; 3) "terminal" cleaning of each suite every 24 hours whether used or not; and 4) intense cleaning of horizontal and vertical surfaces (including shelving and walls) every 7 days—this is a very extensive cleaning in which all mobile equipment is removed from the OR, the entire floor is wet vacuumed, and the walls are washed.

Of paramount importance to the nursing staff was ensuring the best possible patient outcome by maintaining a clean operating room and central materiel service area. This was done even with the long hours and interrupted sleep patterns that come with a combat environment, little relief time, an average of 215 multi-procedure cases per month for 3 OR beds, and limited staff. Given these conditions, culturing by the microbiology lab of various places throughout the hospital gave the OR/CMS staff increased assurance that they were delivering safe patient care. This was the only place that showed "little or no" to "moderate" growth from the samples taken.

Laundering capabilities also posed a problem for the OR. The hospital had one heavy-duty washer/dryer set. These two machines were supposed to clean all of the hospital linen, as well as the scrub attire worn in the OR. Sheets were more often than not soaked with blood and other body fluids. The first few months spent in the desert were frustrating because the laundry and bath staff could not keep up with the volume of linen, and often there were very few sheets. At times linen became a luxury. Additionally, linen that covered the patients who were transferred back to Germany was not replaced. Also, the stains could not be removed from the sheets even with repeated washings. The linen problems continued when the hospital moved into the city of Baghdad as the contractor "lost" the linen on a regular basis. As a creative solution to the linen issue, paper sheets available in the supply system were used instead. Also the one-time non-woven instrument wrappers were used as draw sheets on the OR beds when their use as a sterilization wrap was completed. By using disposable sheets and instrument wrappers to cover patients, the limited linen supply was better utilized.

Infection control

Controlling infections is more complex than sterilizing instruments. The impact of war on the environment makes infection difficult to control. War wounds predispose to infections, and there is a need for committees to provide a systemwide, consistent approach to solving problems. Intradepartmental committees are extremely beneficial if these committees are formed and designated before deployment. The result is uniform patient safety goals, and the entire hospital staff knows the expectations and procedures before actual patient care ever begins.

The Infection Control Committee is a critical committee. The entire hospital must be using the same practices and adhering to the same guidelines. Keeping one area clean does no good if other areas in the hospital where patients are treated do not conform to the same standards. The OR/CMS staff had the dual responsibility of patient care and housekeeping tasks. Even in the Deployable Medical Systems (DEPMEDS) facility, proper cleaning of hospital equipment—

bed rails, litters, carts, counters, sinks, lead wires, IV poles, diagnostic equipment, and more—must be done in order to keep patients safe from hospital acquired infections. With the move to the fixed facility in Baghdad where a "true" Hospital Infection Control Committee was formed, staff members were able to collaborate on strategies to clean their respective areas. Additionally, local Iraqi civilians were hired at the hospital for various jobs. In the OR and CMS areas they started out with facilities type jobs. Some of them were trained to do janitorial tasks in general hospital areas, and other workers were trained by the OR/CMS nursing staff to clean semi-restricted and restricted areas according to the standards and guidelines. This was done by close observation and management of the language barrier. Their ability to clean those areas safely freed up the nursing staff to concentrate more on direct patient care.

Figure 1 shows a simple and easy-to-follow Infection Control Monitoring Tool that can be utilized in any OR/CMS deployment situation (Winthrop T, personal communication). It is suggested that this monitoring tool be taken on CD on any type of deployment so the infection control guidelines concerning the four principles of education, surveillance, monitoring and reporting are in compliance with the following: the OSHA Bloodborne Pathogen Standard, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Recommendations, and the Universal Infection Control Guidelines.

The OR Committee was made up of surgeons, anesthesia providers, OR nurses, OR technicians, and a medical supply representative. This committee met at least every other week to decide what more could be done to improve the workload practices and the workflow within the OR and CMS departments. Formal minutes were taken, and members were encouraged to suggest solutions, implement them, and evaluate their efficacy. This committee also was responsible for establishing and updating the standard operating procedure manual for the OR, CMS, and anesthesia departments.

The human element of infection control

One of the lessons learned was that OR and CMS staff need to be treated with care. It is the staff, and only the staff, that will set and maintain standards. Standards do not maintain themselves. OR/CMS staff must be told to take a rest, a break, or a nap. When the workload stays at a constant pace for 293 days, the leadership needs to recognize how valuable the clinical staff's skills are. When the staff is exhausted, their performance can erode the safe delivery of patient care. Signs and symptoms of fatigue include: forgetfulness, poor decision making, slowed reaction time, reduced vigilance, and poor communication. Other signs and symptoms include becoming fixated, apathetic, or lethargic; being in a bad mood; and nodding off.[7] U.S. Army perioperative nurses pride themselves on their ability to "get the job done," to "conserve the fighting strength," to be "ready, caring, and proud," and to demonstrate "service through mobility." Perhaps the following quote should be reinforced during times of deployment: "Health care organizations, for their part, should assume responsibility for

Figure 1. Infection Control Monitoring Tool
(Adapted from Winthrop T, personal communication)

REVIEWER _____ DATE _____

	DAY	EVENING	NIGHT
EDUCATION			
In-service			
Journal			
MONITORING			
ENGINEERING			
Sharps container			
Eye wash station			
Floors free of litter			
Linen bags turned in			
Eating area clean			
Trash bags with liners			
Areas clean			
Spill kits			
CLINICAL			
Sterilization records			
PPE compliance			
Hand washing			
SURVEILLANCE			
Employee health screen			
Inoculations			
TB screen			
REPORTING			
All breaks in sterility			
Needle/sharp injuries			
Reportable diseases			

PPE = Personal Protective Equipment; TB = Tuberculosis

reforming work practices and for changing attitudes toward work so that exhaustion is considered as posing an unacceptable risk rather than as a sign of dedication."[8]

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Shift work, crossing time zones, long hours of staying awake, inability to sleep in the daytime with ambient temperatures of 130° F, and sleep loss accumulation can cause fatigue for those performing medical tasks and procedures. These factors also can affect their ability to monitor and operate equipment used in the OR and CMS departments. Nurses in leadership positions can improve workplace performance and patient safety initiatives when they creatively schedule naps or rest times into the staffing schedule. Naps can improve alertness. Getting some sleep is always better than getting none.[7]

Sterilization

Patients depend on the science of sterilization and the application of surgical asepsis as the primary method of protection from potentially devastating infections. A major responsibility of perioperative nurses is to use this science to create and maintain an aseptic environment to use surgical instruments, equipment, and supplies safely. Sterilization provides the highest level of assurance that surgical items are free of viable microbes."[9]

The 28th CSH used two forms of sterilization: gravity steam sterilizers at 250° and 270° F, and chemical sterilization using aldehyde (an ortho-Phthalaldehyde) and glutaraldehyde. Moist heat in the form of saturated steam under pressure is the most dependable medium known for the destruction of all forms of microbial life.[10] Heat-stable, reusable medical devices that enter the blood stream or enter normally sterile tissue should always be reprocessed using heat-based methods of sterilization (e.g., steam autoclave).[11] If an instrument is not cleaned properly, it

cannot be sterilized or disinfected.[9] Removing all traces of disinfectant by rinsing the instruments is extremely important. Glutaraldehyde is very caustic to skin and mucous membranes and could contribute to chemical burns. Glutaraldehyde manufacturers are now recommending three separate, sterile rinses of at least one minute each. The rinse water is not to be reused. Specific instructions (located on glutaraldehyde package inserts) on use, reuse, rinsing, and disposal must be followed.[9]

The three methods of monitoring steam sterilization are chemical, mechanical, and biological. Having all three methods available is ideal. Because of the intense (130° F) ambient temperature and supply problems, steam sterilization tape, steam indicators and integrators, and steam biological indicators arrived already "turned" as though they had been processed. In some cases, they arrived already outdated. Similar difficulties were experienced with both aldehyde (an ortho-Phthalaldehyde) and glutaraldehyde process indicators. However, when one method is not feasible (e.g., outdated or "turned" chemical impregnated steam tape and indicators), silk tape and/or string will maintain package integrity through processing. In this instance, observation of gauges to assure the correct time at the correct temperature is needed for the manually run field sterilizer that has no automated record. If biological indicators arrive unusable, then biological indicator test packs need to be created on site. If all three methods are not available, then using a combination of the methods that are available provides sufficient comfort level for sterility assurance.

Lessons learned include that extended sterilization times did not adversely affect the surgical instruments and gave the added assurance that all microorganisms were effectively destroyed. Another lesson learned was that pressure bags applied to intravenous bags of sterile water could be used to more thoroughly rinse the small rigid endoscope lumens (as opposed to using hand-held syringes).

Water quality

Water quality and availability were challenges faced everywhere the 28th CSH was deployed in Iraq. In the desert, water was provided using a reverse osmosis system. This was handled by the military and provided excellent water quality. However, the reservoirs where the water was stored until used were designed in a manner that allowed the desert sand to blow in. As a result, much time and energy was spent cleaning and flushing frequently to prevent corrosion to the mechanism of the field steam sterilizers due to the sand in the water.

When the 28th CSH relocated to the fixed facility in Baghdad, the water quality drastically decreased. The water was very hard, and the calcium in the water actually turned the backs of the steam sterilizers white. Again, frequent cleaning and flushing of the steam sterilizers involved much time and labor that could have been used in other areas of the OR and CMS. With this experience it became very evident that a portable field reverse osmosis system should be included with the field steam sterilizers to obtain quality water.

Hand washing

The surgical hand scrub is an integral part of the operative environment. Surgeons and technicians must perform this procedure each time they prepare to perform surgery. The surgical hand scrub plays a significant role in preventing nosocomial and surgical site infections. After approval from the Infection Control Committee, a two week trial was conducted using a waterless, "scrubless" surgical hand solution (an instant hand antiseptic containing 61 percent wet weight ethyl alcohol in a moisturizing base). It was fast—60 seconds instead of 5 minutes—effective, and FDA-approved. Furthermore, it had test results showing significantly greater reduction of microbial flora on hands in comparison to the traditional hand scrubs using chlorhexidine or povidone iodine. Lessons learned indicate that waterless, "scrubless" surgical hand solutions have a place in future deployments. OR and CMS will always be heavily dependent on water for cleaning rooms, equipment, and instruments. However, hand washing may be satisfactorily accomplished in other ways.

Animal surgeries/CMS issues

Written plans should be readily available for all OR and CMS staff in the event a working dog or other animal is in need of surgical care during a deployment. Recommendations that were followed stated that a separate area should be designated for the veterinarians to perform surgery on the military working dogs or other animals. The valuable military dogs might be used for clearing minefields, tracking people, or tracking other substances. This plan allows for one field steam sterilizer to be set aside for use on animals only. There would also be a separate area where the instruments used on animals would be decontaminated, cleaned, assembled, wrapped, and sterilized. At no time are instruments inter-mixed between humans and animals. This rule is vitally important when dealing with any hoofed animals such as cattle, sheep, goats, and deer. The hoofed animals can be linked to the spongiform encephalopathy conditions responsible for Mad Cow disease and Creutzfeldt-Jakob disease. This disease is caused by prions that require extensive sterilization temperature and time to destroy. Present field equipment is unable to deal with these sterilization requirements in a deployed environment. The lesson learned with regard to surgical instruments used on animals is never to mix the processing or use of those instruments with any use on human beings.[12]

Enemy Prisoners of War

Another lesson learned is that Enemy Prisoners of War (EPW) should be located and cared for in a separate designated hospital. The care of these prisoners can become complicated with regard to multiple security issues. Health care workers need additional training to fill in as guards. Mixing the EPWs and other patients on the same ward and in the same hospital does not lend itself to optimal patient care. In addition to EPWs, the 28th CSH dealt with security internees, criminal detainees, and high value detainees. In the interest of both patient and CSH staff safety, a separate, designated EPW hospital should be established.

Conclusion

While safe patient care is the number one goal of every part of a hospital, both the OR and CMS provide a critical patient safety function that is often "behind the scenes" for patients and other health care professionals. Deployments to harsh climates and hostile countries are becoming more common. Lessons learned related to patient safety are extremely important to any DOD or Federal Agency that will be delivering patient care in less-than-optimal environments in the future.

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